Sampling: Need and designs

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Quantitative ecology

- All about quantifying
  - Populations
  - Habitat
  - Behaviour
  - Environment
Some useful parameters

- Abundance (N)
Some useful parameters

- Density

\[ D = \frac{N}{A} \]

Abundance

\[ D \cdot A = N \]
How to quantify?

• Estimate everything
How to quantify…

• Estimate everything?

😊
How to quantify...

- Estimate still?????

😊😊😊
How to quantify…

• Do sampling!!!

😊
Where to sample?

• Define questions
  – What is to be quantified (Parameter)

• And then…
  – How should it be quantified (sampling protocol/method)
  – When should it be quantified
  – Where should it be quantified (defining samples)
Distribution of object of interest

- Systematic

\[ D = c/a \]
\[ N = D \cdot A \]

- **Definitions**
  - \( a = \text{area of unit} \)
  - \( c = \text{count} \)
  - \( D = \text{Density} \)
  - \( A = \text{Total Area} \)
  - \( N = \text{Abundance} \)
Distribution of object of interest

- Systematic

Count = 12 points
Area of unit = 0.4 km$^2$
Total area = 10 km$^2$

$a = \text{area of unit}$
$c = \text{count}$
$D = \text{Density}$
$A = \text{Total Area}$
$N = \text{Abundance}$

$D = \frac{c}{a}$
$N = D \cdot A$

$D = \_\_\_?$
$N = \_\_\_?$

Count = 12 points
Area of unit = 0.4 km$^2$
Total area = 10 km$^2$
Distribution of object of interest

- Systematic

\[ D = \frac{c}{a} \]
\[ N = D \cdot A \]

\[ D = 30 \]
\[ N = 300 \]

Count = 12 points
Area of unit = 0.4 km\(^2\)
Total area = 10 km\(^2\)

\[ a = \text{area of unit} \]
\[ A = \text{Total Area} \]
\[ c = \text{count} \]
\[ N = \text{Abundance} \]
\[ D = \text{Density} \]
Distribution of object of interest

- Systematic

\[ D = \frac{c}{a} \]
\[ N = D \times A \]

\( D = 30 \)  
\( N = 300 \)  

Count = 12 points  
Area of unit = 0.4 km\(^2\)  
Total area = 10 km\(^2\)

\( a = \text{area of unit} \)  
\( A = \text{Total Area} \)  
\( c = \text{count} \)  
\( N = \text{Abundance} \)  
\( D = \text{Density} \)
Distribution of object of interest

- Random

\( D = c/a \)

\( N = D \cdot A \)

\( a = \text{area of unit} \)

\( A = \text{Total Area} \)

\( c = \text{count} \)

\( N = \text{Abundance} \)

\( D = \text{Density} \)

Count = ?

Area of unit = 0.1 km\(^2\)

Total area = 10 km\(^2\)
Distribution of object of interest

- Random

\[ D = \frac{c}{a} \]
\[ N = D \cdot A \]

\( a = \text{area of unit} \)
\( A = \text{Total Area} \)
\( c = \text{count} \)
\( N = \text{Abundance} \)
\( D = \text{Density} \)

\( D = \, ? \)
\( N = \, ? \)

Count = ?
Area of unit = 0.1 km²
Total area = 10 km²
Distribution of object of interest

- Random

<table>
<thead>
<tr>
<th>Unit</th>
<th>Count</th>
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<tbody>
<tr>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
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<tr>
<td>C</td>
<td>3</td>
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<td>D</td>
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<td>E</td>
<td>2</td>
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<td>F</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>Mean Count</th>
<th>3.5</th>
</tr>
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Mean ($\bar{x}$) = $\frac{\sum x}{n}$

Area of unit = 0.1 km$^2$
Total area = 10 km$^2$

$a = \text{area of unit}$

$A = \text{Total Area}$

$c = \text{count}$

$N = \text{Abundance}$

$D = \text{Density}$

$D = c/a$

$N = D \cdot A$

$D =$ ___?

$N =$ ___?
Distribution of object of interest

- Random

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<td><strong>Mean</strong></td>
<td><strong>3.5</strong></td>
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\[ D = \frac{c}{a} \]
\[ N = D \cdot A \]
\[ D = 35 \]
\[ N = 350 \]

Area of unit = 0.1 km²
Total area = 10 km²

\[ a = \text{area of unit} \]
\[ A = \text{Total Area} \]
\[ c = \text{count} \]
\[ N = \text{Abundance} \]
\[ D = \text{Density} \]
Distribution of object of interest

• Random

\[ D = \frac{c}{a} \]
\[ N = D \cdot A \]
\[ D = 35 \pm x \]
\[ N = 350 \pm x \]

\(a = \text{area of unit} \)
\(A = \text{Total Area} \)
\(c = \text{count} \)
\(N = \text{Abundance} \)
\(D = \text{Density} \)

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| Mean  | 3.5   |
| StDev | 1.04  |
| 95% CI| 2.7-4.3 |
Time for lego